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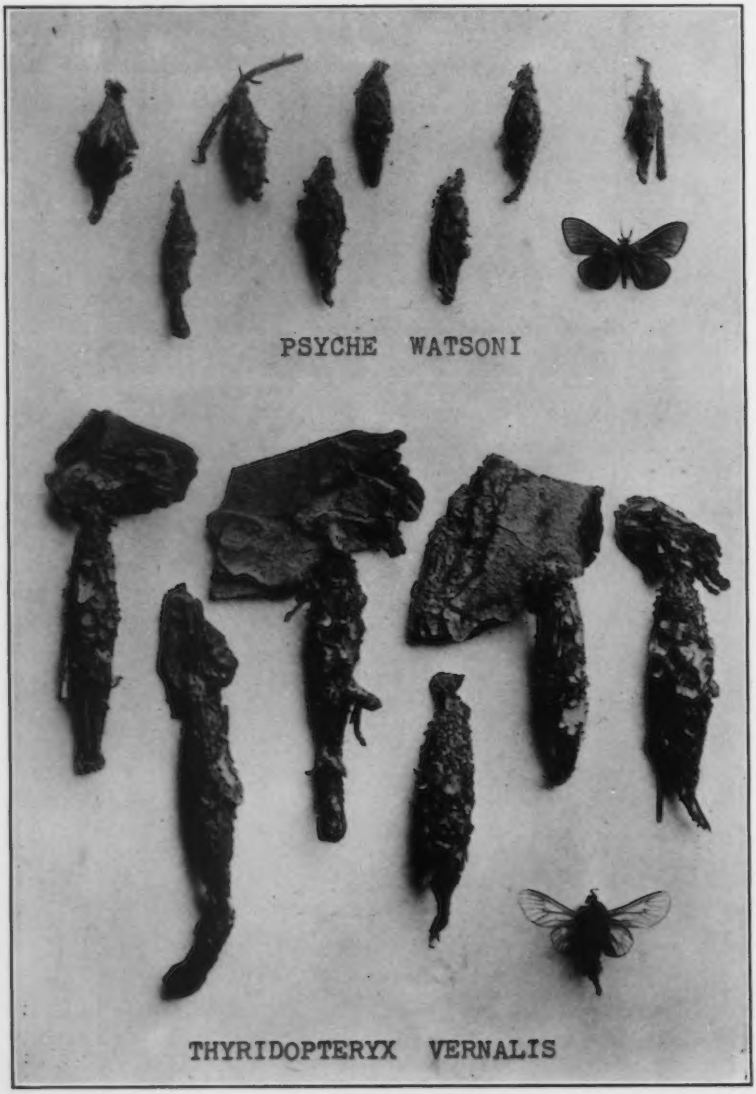

TWO NEW PSYCHIDS.—JONES.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA

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Variation in Thyridopteryx: Two New Psychids (Lepid.: Psychidae).

By FRANK MORTON JONES, Wilmington, Delaware.

(Plates III, IV.)

In the *Psychidae*, wing-venation of the male has been largely employed in the characterization of species, genera and sub-families; but when, judged by this character, we not infrequently reach the absurdity that one-half of an insect falls to one species, genus, or sub-family, the other half to another genus or even to another sub-family, it becomes apparent that until we determine, for a given species, the prevalence and extent of such variation, this character considered alone must be most inconclusive and unsatisfactory.

Of our North American *Psychids* probably no species is more variable than *Thyridopteryx ephemeraeformis* Haw. The fol-

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lowing notes on this species are based on the examination of fifty males, from a considerable range of food-plants and localities, the specimens taken at random from the breedings of a period of ten years. It is confidently believed that a single species only is represented in this material, and this belief is not modified by the extreme variability of structure manifested, for the full range of variation in any one venational character is not infrequently exhibited in a single asymmetrical insect.

If we consider Comstock's figure to represent the normal venation of *ephemeraeformis*, he shows an 11-7 veined insect with R_3 and R_4 (9 and 8) of primaries stemmed to the cell, M_2+M_3 (5 and 4) of both wings coincident, $Sc+R_1$ (8) of secondaries stemmed with R_s (7)—then of the fifty examples studied, seventeen, or only 34%, approximate the normal venation (Plate IV, figs. 1 and 3).

With regard to the number of veins reaching the wing-margin, the most common variation is in the divergence of the normally coincident 4 + 5 of primaries (Plate IV, fig. 6), eight examples of the fifty showing these veins divergent at the margin, stemmed to the cell, on one or both primaries, and three showing these veins of secondaries (fig. 4) similarly divergent and stemmed. One example (fig. 9) shows vein 2, another (fig. 6) vein 6, forked at the margin on one primary; one lacks vein 9 (fig. 5) on one primary, another (fig. 10) vein 11; and several show vein 6 completely fading out before reaching the margin. In three examples (fig. 2) vein 7 on one primary is stemmed to the stem of 8 and 9, and in one example 10 is stemmed to the stem of 8 and 9; in two, a spur from the cubitus toward the anal veins (fig. 9) partly closes a cell bounded by these veins; in one example (fig. 5) vein 1c (Comstock's 1st Anal) of primaries, usually a short internal spur and often scarcely visible, is strongly developed to the outer margin.

On the secondaries, two examples (not illustrated) show on one side vein 6 entirely absent from cell to margin, and one example shows this vein absent on both secondaries; veins 7 and 8, normally slightly to widely divergent at margin, are rarely coincident from cell to margin, as shown in fig. 11 (*vernalis*); and the basal portions of these veins, in ten of the fifty, are modified as illustrated in figure 7 or figure 8, on one or both sides.

The primaries of seven of the fifty (figs. 9 and 10) show from one to four accessory cells formed by veins 10 and 11, 7, 8, 9, and 10, or even by 6 and 7, these cells usually occurring in one wing only. Figure 9 is a composite of the right and left primaries of the same individual; figure 10 is drawn from two examples, one lacking vein 11, the other

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with 6 and 7 forming an accessory cell; all the other figures of venation are traced from individual wings. Whenever necessary for study, the wings were cleared with a brush and examined dry,—not chemically bleached and mounted in balsam, the latter method frequently causing the disappearance of weak veins.

A composite to exhibit the maximum complexity of venation indicated by the variations in these fifty specimens, counting the anal veins as one, and numbering consecutively all the others running to the margin, would show a 14-8 veined insect with a whole series of accessory cells; a composite to show the minimum venation indicated, a 9-5 veined insect with no accessory cell. It would be difficult to assign phylogenetic significance to many of these variations. Perhaps the most significant is the frequent furcation of 4+5, indicating the correct identification by Comstock of the normally missing vein of *ephemeraeformis* as *M2* (5), not *M1* (6).

Size, wing shape, density of scaling, number of antennal joints, leg armature, form and chitinization of the abdominal plates, to some extent the genitalia, share in the structural variability of this insect; so that several fictitious species might excusably be characterized, or a closely related insect escape detection, in this remarkable medley of structural variation. In the belief that the latter actually has occurred, it is here proposed to describe a form which has been under observation for many years, and which certainly deserves a name.

Few caterpillars have a longer list of observed food-plants than *ephemeraeformis,* for though it shows preference by especially abounding on arbor-vitae, cedar, willow, sassafras, locust, persimmon, button-ball, and many other trees and shrubs, yet lacking these it seems to thrive even on herbaceous plants. Its familiar life-cycle, described so frequently in the extensive literature of the species, is that of a single-brooded insect, emerging in the late summer or the fall, and passing the winter in the egg stage only. The systematic winter examination of hundreds of the "baskets" indicates the invariability of this life-cycle, at least in the more northern distribution of the species. In distinction from this polyphagous habit and this life-cycle, from southern Delaware to Georgia a related insect has been re-

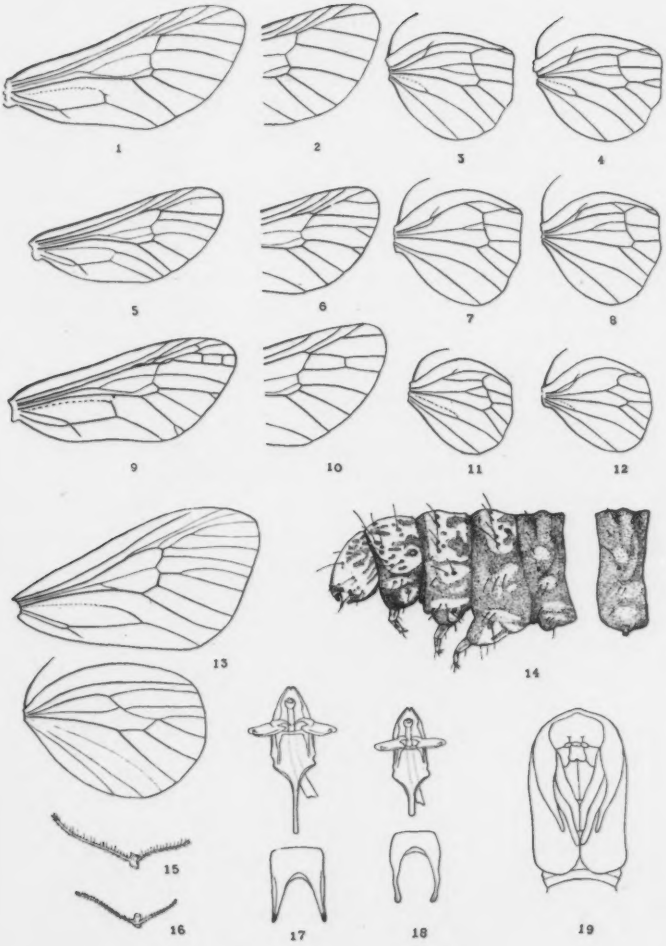
peatedly observed upon a single food-plant and which hibernates as a larva, completing its transformations in the spring. For this insect is proposed the name of

Thyridopteryx vernalis n. sp. (Plates III; IV, figs. 11, 12).

Larval case, affixed for pupation.—Length 38-50 mm.; diameter 8-9 mm. in the ♂, 11 mm. in the ♀; frequently affixed to the bark of the tree, often near the base of the trunk, by a flat button of silk, and rarely expanding the button into a twig-encircling band as in *ephemeraeformis;* the case of the ♂ is longer and proportionately more slender than is usual in *ephemeraeformis,* and the lower extremity, until stretched by the emerging moth, is contracted into a tail-like appendage; fine particles of bark are extensively incorporated into the silk composing the case, and the larger particles attached externally are usually flakes of bark or bits of lichen, rather than of leaf. In neither sex is the shape and texture of the case obscured by this attached material, as is so commonly the condition in *ephemeraeformis.*

Adult ♂.—Expanse 25 mm.; in appearance very similar to *ephemeraeformis;* the collar is usually conspicuously and contrastingly gray, the patagia sometimes mixed with gray; in shape and venation the primaries resemble those of *ephemeraeformis,* two of five examples showing 4 + 5 furcate at the margin, and none showing accessory cells; the secondaries are usually proportionately smaller than is common in *ephemeraeformis,* with highly arched costa and rounded rather than angulated outer margin; the venation of secondaries may duplicate that of normal *ephemeraeformis,* but in two out of five examples the course of vein 7 (the apparent 6th vein) is as in figure 12, and in one example as in figure 11, neither of these being duplicated in the fifty specimens of *ephemeraeformis* with which they were compared; in *vernalis,* 7 and 8 of secondaries are usually coincident from cell to margin, and are very rarely so in *ephemeraeformis.* The genitalia are not obviously different from those of *ephemeraeformis;* but the dorsal abdominal plates, in the material examined, are conspicuously narrower than in that species.

Described and illustrated from five adult males and many larval cases. *Type locality:* Seaford, Sussex County, Delaware; emergences in May, from cases collected at Seaford, Delaware; Tilghman's Island, Saulsbury, and Ocean City, Maryland; Chincoteague Island, Virginia; the characteristic cases were also collected at Summerville, South Carolina, and Tallulah Falls, Georgia. The *type material* is in the collection of the author. Food-plant, *Pinus rigida* (and probably related pines, not distinguished).



THYRIDOPTERYX EPHEMERAEFORMIS, 1-10; T. VERNALIS, 11-12; PSYCHE WATSONI, 13-15,17,19; PS. GLOVERI,16,18.—JONES.

Larvae were obtained in the late summer and in the autumn, and in some numbers and of various ages were successfully carried through the winter, but none lived to complete their transformations after becoming active in the spring. All the adults secured were from cases gathered in the open and after pupation, in April or May. This insect has thus been under occasional observation since 1892. The repeated evidence of its spring emergence, its consistently characteristic larval case and single food-plant, seem fairly conclusive of its specific distinctness, aside from the color and structural characters which usually serve to separate it from *ephemeraeformis;* if further study of the latter species, especially in its southern and southwestern distribution, should necessitate a change of status, the name *vernalis* may properly be applied to the spring-emerging gray-collared form here described as distinct.

Among the insects collected in Haiti in the spring of 1922 by Mr. F. E. Watson, of the American Museum of Natural History, were numerous specimens of a small *Psychid* found feeding upon the leaves of the Sea-grape, *Coccolobis.* Included in this material were old cases spun fast for pupation, and living larvae of various ages. The latter, brought to this country in April, accepted a variety of food-plants including leaves of maple and rose, and upon rose a few were carried through to maturity. Averaging slightly larger but otherwise resembling our *Psyche* (*Platoeceticus*) *gloveri* Packard, this insect presents structural characters conclusively separating it from that species, nor does it seem to be among the few *Psychids* recorded from the West Indies, and for it is proposed the name of

Psyche watsoni n. sp. (Plates III, IV; figs. 13-15, 17, 19.)

Larval case.—15-20 mm. in length; widest at the middle, tapering toward both ends; of grayish silk and of rather smooth texture, more or less decorated with small fragments of leaf or bark, irregularly applied; in some examples these completely cover the silk, usually without obscuring the shape of the case; in others the pale gray silk is only flecked with minute particles of extraneous matter.

Larva, last stage (Pl. IV, fig. 14).—Length 13-20 mm; width of head 1.6 mm. Dark brown; the head and the heavily chitinized portions of the thoracic segments are pale (almost white) with dark brown dots and foliaceous bars, much as in *Oiketicus.* The upper portion of the

front is pale, conspicuously outlined laterally by the dark frontal sutures, and below by the dark brown clypeus, from which an upward extension of the dark area surrounds each of the two frontal setae, leaving the pale area of the front symmetrically arrow-shaped; the frontal punctures are included in a double brown dot; the ventral margin of the clypeus and the antennal basal cones are pale, the labrum and the distal portions of the antennae ferruginous. The frontal setae are well below the level of the frontal punctures, and the 2nd adfrontals are slightly above the punctures.

Pupa of ♂ (Pl. IV, fig. 19).—Length 8-10 mm.; reddish amber brown, darker on the distal portion of the wings, and almost black on the caudal margins of abdominal segments 2, 3, 4, 5, 6 and 7, on each of these segments forming a broad well-defined dark ring about the abdomen; the wings extend ventrally almost to the cephalic margin of the 4th abdominal segment; the antennae and the prothoracic legs terminate opposite the caudal margin of the first abdominal segment; a dorsocephalic spiny ridge, the teeth directed cauded, is present on segments 4, 5, 6, 7 and 8, the ridge shortened but the teeth enlarged on 8; of segments 3, 4 and 5 (sometimes vestigally on 2) each bears a dorsocaudal row of fine short spines, their points bent cephalad; the caudal thorns are weak and are not darkened, and the spiracles are raised slightly above the body surface.

Compared with the pupa of *gloveri* Packard, *watsoni* has longer maxillae (Mosher nomenclature), these exceeding the labial palpi by nearly half their length.

Pupa of ♀.—Length 11-13 mm.; bright mahogany brown, the caudal margins of the free abdominal segments black and conspicuously contrasting.

Adult ♂.—Expanse 15-20 mm. A sooty black opaque-winged species of rather slender build, the abdomen in dried examples equalling or slightly exceeding the secondaries. The antennae are dark, broadly bipectinate, and have about 31 joints; compared with *gloveri*, the antennae of *watsoni* (fig. 15) are longer, more broadly pectinated, and have greater number of joints; the pectinations are smooth surfaced,—not irregularly cross-striate as in *gloveri*,— and the hairs which clothe the pectinations are longer and finer and are more regularly arranged in spaced rows,—not short, stubby and irregularly placed (fig. 16) as in *gloveri*. The fore tibiae are not spined. The genitalia of *watsoni*, (fig. 17) especially the saccus, are proportionately longer and narrower than those of *gloveri*, and the furcations of the "8th sternite" plate are tapering, pointed, and regularly divergent in *watsoni*,—in *gloveri* (fig. 18) more uniformly narrow and at their extremities rounded and spoon-like.

The costa of primaries is arched, the apex rather acute; the secondaries rounded. The primaries have twelve veins; 4 and 5 are stemmed

to the cell; 8 and 9 are stemmed, and 7 may proceed from the same point on the cell, or may be shortly stemmed to the stem of 8 and 9. The secondaries have eight veins, with 4 and 5 shortly stemmed or from a common point; 7 and 8 are not usually connected. The anal veins of primaries send one short branch to the inner margin at about one-fourth the wing length from the base, and coalesce beyond the middle of the wing. The venation of *watsoni* (fig. 13) is thus substantially identical with that usually presented by *gloveri* Pack., which, contrary to Packard's characterization of the genus *Platoecetieus,* is more frequently 12-8 than 12-7.

Described and illustrated from five males, bred from larvae collected in April, 1922, by Mr. F. E. Watson, at Aux Cayes, Fort Ilet District, Haiti, and emerging as adults May 22 to September 1, 1922. The *type* and *type material* are deposited in the American Museum of Natural History, New York. This insect is named in honor of its collector, through whose kindness the author has been permitted to examine and describe it.

Acknowledgment is also due to the Rev. C. R. N. Burrows, of Stanford-le-Hope, England, whose prolonged study of the palaearctic *Psychidae* is providing a basis for the intelligent use of the genitalia and the abdominal plates in the classification of this difficult group, and who has most generously, in advance of publication, placed all of his results at our disposal.

Notes on Rhodobaenus 13-punctatus (Ill.), the Cockle-Bur Bill-Bug (Col.).

By HARRY B. WEISS and RALPH B. LOTT, Highland Park, New Jersey.

This species which is listed by Smith (Ins. N. J., p. 397) as occurring throughout New Jersey and breeding in the stems of a variety of weeds such as *Ambrosia, Helianthus, Oenothera, Xanthium,* etc., was made the subject of some observations during the summer of 1922 and the following notes represent our summarized findings:

The adult overwinters and in the central part of New Jersey (Monmouth Junction) eggs are plentiful in the field during the first two weeks of June, although newly hatched larvae can be found during the first week of June. The adults do consider-

able feeding at this time, puncturing the stems and bases of the leaf petioles which injured places later turn black and become distorted. All of our observations were confined to ironweed (*Vernonia noveboracensis*) as other weeds did not appear to be infested. In addition to Smith's host records, Riley (3rd Ann. Rept. Nox. Ben. Other Ins. Mo., 1870 (1871), p. 60) also mentions *Xanthium strumarium*, the common cockle-bur. Chittenden mentions *Eupatorium perfoliatum*, *Polymnia uvedalia*, *Cirsium* and *Silphium* in addition to those already listed (Bull. 22, U. S. Div. Ent. 1900). Webster (Bull. 40, Div. Ent. U. S. Dept. Agric., 1903) records the adult as feeding on the half-ripe seeds of the garden sunflower and the larvae as burrowing in the stalk. It is therefore evident that the species is more or less of a general feeder within a wide range of plants.

In ironweed most of the eggs appear to be deposited in the upper portion of the young stem. The egg cavity is a rather shallow, longitudinal cavity. In this depression will be found what appears to be a wisp of shredded tissue anchored to each end of the cavity and in the central part of this wisp is the elongate, whitish egg. Usually the wisp of tissue and the sides of the cavity become black and are more or less soiled with excrement. After hatching, the larva bores up the centre of the stem for a short distance and then downward, the entire larval cavity reaching an average length of about twelve inches. Many infested stems contain small openings full of grass and it is quite likely that these are made by the larva for the purpose of getting rid of borings, etc., as the larval cavities were comparatively free from such materials. Only one larva was found to a stem. By the first week of August many larvae are full grown and some have pupated. The pupal chamber, which is from one to one and one-half inches long, is usually located in the middle of the larval cavity and separated from it by closely packed borings. About the last of August and beginning of September adults appear, escaping through circular openings in the sides of the stems.

Egg. Length about 1.29 mm. Width about 0.6 mm. Elliptical with broadly rounded ends. Whitish.

Mature Larva. Form subcylindrical, tapering slightly at both ends,

more so posteriorly, slightly curved, smooth, creamy white, head reddish brown. Head comparatively small, subcircular; collum absent; epicranial suture distinct; epicranial halves bearing a few long chitinous hairs; frons triangular slightly tuberculate anteriorly, bearing two chitinous hairs near lower edge, one on each side near angles. Clypeus transverse, light brown. Labrum with anterior edge arcuate and fringed with closely placed short, chitinous hairs; two hairs arising from middle surface of labrum. Ocelli convex, lenticular, on front margin of head. Antennae minute, single jointed, almost obsolete. Gula indistinct, membraneous. Labium with mentum and submentum fused, anterior edge circular, terminating in an acute point posteriorly. Labial palpi short, two-jointed. Maxilla bearing several chitinous hairs, fused with labium to near apex; maxillary palpi two-jointed, first joint barrel-shaped, apical joint minute; galea absent; lacinia fringed with short chitinous hairs on inner surface. Mandibles triangular, broad across base, slightly bifid at tip.

Thoracic segments slightly compressed rather short. Prothoracic segment slightly embrowned dorsally. Thoracic and abdominal segments transversely wrinkled, each with three dorsal plicae.

Abdominal segments four, five and six sometimes somewhat swollen and constituting the widest part of the body. Last two abdominal segments slantingly truncate dorsally, penultimate one bearing two oval brownish areas, each enclosing two or three black, thread-like marks; between these oval areas is a slight, broad elevation bearing two chitinous hairs. On lateral side of each oval area is a large broad tubercular elevation bearing two setae; anterior to each oval area is a transverse tubercular area bearing two chitinous hairs, one on either side of a median line. Ultimate segment bearing eight chitinous hairs in groups of four each on either side of middle. True legs absent, indicated by ambulatory tubercles, each bearing four comparatively long hairs and sometimes several short ones. Cerci absent. Hairs on head and posterior abdominal segments are the longest. Length of larva about 13 mm. Greatest width about 4 mm.

Pupa. Creamy white. Elongate, subcylindrical, third and fourth abdominal segments sometimes wider than remaining abdominal segments or thoracic segments. Head bearing a single pair of chitinous hairs near anterior edge. Beak bearing three pairs of chitinous hairs, one pair above and one small pair below antennal insertion and one pair at the antennal insertion, several minute hairs present. Antennal cases oblique, reaching to near the ends of the femora of the first pair of legs.

Femora of all pairs of legs bearing a short chitinous hair near distal end. Prothorax bearing a transverse row of six chitinous hairs situated about one-half way between anterior and posterior edges; posterior to this row, on each side and nearer the posterior and lateral edges are two closely placed hairs. Mesothorax bearing a diagonal row of three

hairs on each side of a median line and several scattered, smaller ones. Metathorax with a transverse row of chitinous hairs, three on either side of a median shallow depression.

Abdominal segments each bear a row of dorsal, transversely placed chitinous hairs, four of them being closely placed on either side of middle on all but seventh segment which bears three closely placed ones. Ultimate segment with two lateral tubercles each bearing a group of four long, chitinous, downwardly directed hairs. All hairs becoming longer posteriorly. Large lateral spiracle on prothorax. Length of pupa about 10 mm. Width, 3-4 mm.

Adult. This was described by Illiger in 1791 (Schneid. Mag. V. 1791, 613). Blatchley and Leng (Rhyn. N. E. Amer. 1916, p. 550) give a redescription of the beetle and state that it occurs over the entire United States. In Leng's "Catalogue of the Coleoptera of America North of Mexico," two varieties based on color are listed, these being *pulchellus* (Schon.) and *quinquepunctatus* (Say). The species is variable insofar as its spots are concerned and this variation is probably responsible for the nine synonyms listed in this catalogue. Chittenden (loc. cit.) has observed two chalcidid parasites, one being *Habrocytus rhodobaeni* Ash.

The Anal Veins in the Wings of Diptera.†

By Alex. D. MacGillivray, Urbana, Illinois.

The students of Diptera as a rule recognize only a single anal vein. Some exception is found to this in the superfamily Tipuloidea where most, if not all, species have at least two easily recognized anal veins. To the first of these Osten-Sacken applied the name of axillary and to the second the name of spurious. This terminology is used by Williston in the last edition of his *Manual.*

Osten-Sacken, although he figures the wings of forty species of Tipulidae, shows in only a few cases an additional anal vein to the two just named and one of these figures, the wings of *Gnophomyia tristissima,* is the only figure of a tipulid wing showing this additional anal vein accurately.

Needham, in his paper on the wings of the Tipulidae, recog-

†Contributions from the Entomological Laboratories of the University of Illinois, No. 79.

nizes only two anal veins. The additional vein is not shown on a single one of his many figures, many of which are very inaccurate for the anal region. This additional anal vein, however, can be readily identified on each of the six figures of wings reproduced from photographs. This additional vein is not shown on any of the over two hundred and fifty wings of Tipuloidea figured by Alexander.

Redtenbacher, the first author to use a uniform system for the naming of the veins of the wings of insects, in his classic paper on the wings of insects, *Flugelgeader der Insecten,* shows fairly accurately the three anal veins in a wing of a *Tipula,* but it is doubtful if he appreciated the full significance of his figure.

Comstock in his *Manual* shows in practically every figure this additional anal vein. It should now be stated that this additional anal vein is the first anal vein or *1st A.* The figure of *Protoplasa* which shows only a single anal vein was copied from Osten-Sacken. It is very inaccurate in the anal region. For this wing, as well as all the wings of the Tanyderidae, contains three anal veins. While the artist, who made the figures of Comstock, was consistent in showing the first anal vein in practically every wing, he has rarely drawn this vein accurately. Attention should be called to the fact that Comstock did not recognize the structure here designated as the first anal as a distinct vein, but only as a fold, the anal fold.

Comstock and Needham in the *Wings of Insects* have not departed from the interpretation given by Comstock in his *Manual.* The drawings used in making the figures for the *Manual,* relabelled with their new system of letters instead of the numbers used by Redtenbacher, are used.

Comstock in *The Wings of Insects* has the following to say about the anal veins of the Diptera:—"In most Diptera the first anal vein is wanting as a distinct vein but in many there is a suture-like line, the anal furrow, immediately back of cubitus and closely parallel with this vein; this is a vestige of the first anal vein; this furrow is represented in several of the figures in this chapter by a dotted line. The first anal vein is retained, however, in certain Asilidae; where, although some-

what shortened, it is a distinct vein extending from the base of the wing to near the point where vein *Cu* forks. The second anal vein is the most persistent of the three anal veins; it is well preserved in many families; and is represented in several of the figures in this chapter. The third anal vein is well-preserved in comparatively few forms, although a vestige of it exists in many. It is well preserved in *Tipula* and is fairly, well preserved in *Stratiomyia*." This is an excellent, concise, general statement of the anal region of the dipterous wings as I understand it.

There are several features existing in the proximal end of the wings of Diptera not included in the above account. It is unfortunate that the expense of reproducing figures is such that figures cannot be included, as the structures to be described have not been figured. They will soon be shown, however, in a number of wings in a morphological text-book to be printed soon, it is hoped. An examination of the proximal portion of almost any tipulid wing, as *Tipula cinctans,* shows a long area behind $R+M$. There is extending into this area three long spurs, two of which, if they are represented upon figures, are usually shown as extending obliquely toward $R+M$ with which they are usually shown as fused. They are never fused, however, so far as I have observed, but their direction and position are due to folds in the wing membrane which they support. The first spur extends from opposite the proximal end of cubitus and the caudal end of the arculus. It is always present in the Tipulidae. The second spur is always much longer than the first and while it is found in all Tipulidae it is also distinct in many other Diptera, as for example, *Culex, Dixa, Rhyphus. Leptis, Tabanus* and *Eristalis.* The second spur appears, particularly in the Tipuloidea, as a continuation of the second anal vein. The third so-called spur, which is frequently long, especially so in *Tipula,* is generally omitted from figures and appears to be a direct continuation of the third anal vein. The first two of these so-called spurs are true spurs and may be known as the cubital and anal spurs respectively, but the other projection represents the combined cubitus and three anal veins.

In *Tipula* a cross-vein-like structure extends from cubitus

to the second anal vein opposite the caudal end of the arculus. This apparent cross-vein is considered as the continuation of the stem of cubitus. Comstock has shown in the case of *Sialis* and other species from a study of pupal wings that this is the actual course of cubitus. That such must be the course of cubitus in the Diptera seems self-evident. This transverse part of cubitus is not always located opposite the arculus but may be situated distinctly nearer the proximal end of the wing, as in *Cladura* and *Tricyphona*. In *Rhyphus, Scenopinus* and *Hilaria,* where the cubital spur is not represented, the transverse part of cubitus has changed its course and extends lengthwise of the wing. *Eulonchus, Midas* and *Eristalis* show an almost complete suppression of the transverse part of cubitus and a large anal spur continuous with cubitus and the second anal vein. The Tanyderidae, particularly *Tanyderus* and *Protoplasa,* show an entirely different modification of this region so far as I have studied it. The cubital spur is as a rule not present while the transverse part of cubitus has been suppressed by the anastomosis of the second anal vein with the longitudinal part of cubitus at the caudal end of the arculus.

The first anal vein in the Diptera is frequently a distinct vein in the Nematocera, particularly at its point of origin, sometimes extending nearly to the margin of the wing and usually to or beyond the cubital fork. The enlarged proximal portion of this vein, which is always vein-like, usually arises from the angle formed by the union of the transverse part of cubitus and the second anal vein, sometimes from the second anal vein. The fact that it has actual origin from the transverse part of cubitus is sufficient to disqualify it as a furrow and to prove Comstock's contention that it is a true vein. If it is a true vein, it cannot be other than the first anal vein. Through the changes in the position and direction of the transverse part of cubitus in the Brachycera and Cyclorrhapha, there is apparently a change in the origin of the first anal vein. An examination of such wings as *Leptis* and *Tabanus,* however, leaves no doubt that even in the specialized Diptera, the first anal vein arises from the transverse part of cubitus.

There is no question that the anal spur is a spur formed on

the angle of the combined cubitus, first and second anal veins in the wings of the Tipulidae where the three proximal projections extending into the area on the caudal side of *R+M* are usually present. That the single projection usually figured as a continuation of cubitus in the wings of the specialized Diptera is homologous with the anal spur in the Tipulidae is easily proven by an examination of the wings of such genera as *Rhyphus, Eulonchus, Hesperinus, Eristalis, Midas, Scenopinus, Hilaria, Psilopus, Conops, Stratiomyia* and *Erax*, where the third so-called spur, the stem of *Cu+A* is present. The *A* of the formula just used is the equivalent of *1st A+2nd A+3rd A* and is always used in this sense.

In many Tipulidae there is, near the caudal end of the transverse part of cubitus, another transverse cross-vein-like structure, which is here homologized as *Cu+1st A+2nd A*. In the genera named in the preceding paragraph there is some variation in the portion of the caudal vein preserved; in *Rhyphus*, for instance, the distal part of *3rd A* is distinct and the proximal portion represented by folds, while in *Erax* and *Scenopinus* the combined proximal portion is distinct and the most of the distal portion of *3rd A* has disappeared.

The wings of *Protoplasa fitchii* and other tanyderids show three anal veins, as already stated, and not a single one as the figure of Osten-Sacken would suggest. The first anal is of the same distinctness as this vein in the Tipulidae and was undoubtedly considered as a fold and for this reason omitted from the figure. The cubital spur is wanting and the anal spur is long. The stem of *Cu+A* is prominent while the free part of the third anal vein is short; instead of extending toward the distal end of the wing, it extends obliquely proximad in line with the cross-vein-like portion of the fused *Cu+1st A+2nd A*.

The correctness of this interpretation of the relation of the cubital and anal veins of the proximal end of the wing rests or falls upon the question whether the transverse cross-vein-like vein opposite the caudal end of the arculus in the Tipulidae is the continuation of the stem of cubitus or not. Comstock shows such a modification of the base of cubitus in the Tri-

choptera, Micropterygidae, and Hepialidae. I believe that a similar switching has occured in the Diptera and that the veins of the anal region should be homologized as stated above. Unfortunately the pupal wings offer no corroborative evidence in this order, since the tracheae do not map out the course of the veins.

I am especially indebted to Dr. Charles P. Alexander, of the Massachusetts Agricultural College, for an opportunity to study his very extensive collection of mounted wings of Tanyderidae and Tipulidae.

Observations on the Occurrence and Biology of Triatoma flavida in Cuba (Heterop.: Reduviidae).

By Prof. Dr. Med. W. H. HOFFMAN, Habana, Research Laboratory of the Health Department, Republic of Cuba

In March, 1922, Dr. S. C. Bruner, Entomologist of the Agricultural Station of Santiago de las Vegas, published a notice that he had received from the eastern part of Cuba a Reduviid, which he had identified as *Rhodnius prolixus* Stål. The notice attracted my attention because the Reduviids, especially *Triatoma conorhinus* (formerly *Conorhinus megistus*) and *Rhodnius prolixus* are known as natural carriers of human trypanosomiasis in South America, and I had been seeking for those Reduviids in Cuba for some time, though I was informed by experts that they do not exist here, also that the disease just mentioned is not observed in Cuba.

It seems really that this insect is very rare in Cuba. Besides the one or two specimens of Dr. Bruner, I have been able to obtain one more from the same source. But all the other attempts, to get animals or any notice about them, failed. There is no doubt, however, that the animal belongs to the fauna of Cuba, because it is already found in the well-known collection of the Museo Gundlach of Habana. Lately I heard of its occurrence in the provinces of Camaguey and Santa Clara. Recent information from the U. S. National Museum in Washington, however, is to the effect that it is really *Triatoma flavida*, described by Neiva in 1912 from the type in the Museum in Washington.

Fortunately the animal which I have is a female which laid many eggs from which I have been able to rear a great number of larvae, so that I could make a series of biological observations which may have some interest, although I do not think it necessary to give a detailed description of the insect, which is very similar in its form and size of 3 cm. to *Triatoma conorhinus*, but having a color which is more yellowish grey.

The natural habits in Cuba are little known. In South America the Reduviids live in human houses; but possibly that is a recent habit and it might be, that in this country they prefer other conditions, perhaps even another host.

I have fed the female for six months with my own blood, because I wanted to know if the animal is infected, which seems not to be the case, also in the contents of the intestines I never found suspicious organisms, especially no flagellated forms of protozoa.

The female has laid eggs every day, from June 18 to the present day (December 1), on the whole about 600 eggs. From June to the beginning of September all the eggs, about 370, were fecundated. I suppose that the female, being isolated, must have kept in its organs sufficient quantity of sperm for fecundation since the last copulation with a male before being caught. All the eggs, laid since September, about 200, proved to be sterile.

The eggs are whitish yellow, of regular oval form, 1.5:2.5. mm. in size. They have at one end a cover, which opens in a regular line, to let the ripe embryo pass. The eggs, if fertilized, assume in a few days a pink color, the embryo being transparent through the chitinous wall of the egg. After 2-3 weeks the young larvae come forth, being very vivid from the beginning. They are of darkish color and like to put some particles of dust on the surface of their bodies to be less visible. They begin to suck blood after some days very easily. I used to feed them on my arm every 7-9 days, though they can live a longer time without food. Until now they have developed very well, but in 5-6 months have not reached more than 12mm. in length, so that the whole development will take more than one year. The bite is not painful but generally the next day some swelling develops.

Many times I have observed that the larvae easily suck the blood from the well filled abdomen of other larvae or of the mother instead of from the human skin. This observation is of special importance for pathology, because in many diseases it is supposed that the germs are transmitted hereditarily in the arthropod host. This question must be studied anew, because the observations on *Rhodnius* show that the larvae may become infected by sucking blood from infected insects, producing the impression of hereditary transmission if only the fact is considered, that they were not given a chance to suck blood from a patient. Of course the corresponding observations may be much more difficult in other animals than in *Rhodnius*.

Undoubtedly the presence of *Triatoma* is of great hygienic importance for Cuba and it will be necessary to pay careful attention to the study of the presence of trypanosomal infection in man and to its possible importation from South America and to prevent an eventual infection of the Reduviids.

Additional Records of Lepidoptera from North Carolina. I. Papilionidae to Noctuidae both Inclusive.

By C. S. BRIMLEY, Division of Entomology, N. C. Department Agriculture, Raleigh, North Carolina.

This list contains species not listed in previous papers by us on the Lepidoptera of North Carolina (see Entomological News, March, 1907, p. 94, April, 1904, p. 120, and January, 1909, p. 33).

I. BUTTERFLIES.

PIERIS NAPI Linn. Spruce, several specimens taken in late May of 1912 and 1913.

TERIAS ELATHEA Cramer. Smiths Id., summer, 1909, C. L. Pollard.

HELICONIA CHARITONIA Linn. Skinner in his Catalog of Rhopalocera gives its range as North Carolina to Florida.

PHYCIODES PHAON Edw. Smiths Id., summer, 1909, C. L. Pollard.

DANAIS BERENICE Cramer, Southern Pines, Beaufort, Whiteville and Smiths Id., all eastern localities, May to August.

DEBIS CREOLA Skinner. Two males taken by myself at Raleigh on September 29, 1902, and in August, 1911.

LYCAENA SCUDDERI Edw., Blantyre, mid May, 1908, F. Sherman.

THECLA HENRICI G. and R. Raleigh and Tryon in April, these records being attributed to *T. irus* in Ent. News for March, 1907, but *irus* remains on our list by virtue of specimens of that species taken at Asheville by J. H. Comstock on June 30 and July 3, 1901 and at Blantyre by Sherman in mid-May, 1908.

PAMPHILA ETHLIUS Cramer. Magnolia, early October, 1911, larvae very destructive to cannas, and adults bred from same. S. C. Clapp.

PAMPHILA ARROGOS B. and L. Richmond County, August, 1893, F. M. Jones.

PAMPHILA MACULATA Edw., Wilmington, August, 1893, F. M. Jones.

II. MOTHS.

HEMARIS DIFFINIS Boisd. Joanna Bald, near Andrews, mid May, 1908, one, FS.

TRIPTOGON LUGUBRIS Linn. Southport, Nov. 4, 1919, one, J. E. Eckert.

AMPELOPHAGA CHOERILUS Cramer. Raleigh, bred from larvae on *Azalea nudiflora* in May, and taken in June, July and August; Southern Pines, taken by Manee in August.

AMPELOPHAGA VERSICOLOR Harris, one bred from larva on *Cephalanthus* May 9, 1909.

SPHINX CHERSIS Hübner. A battered specimen taken at light at Raleigh, June 17, 1912.

SPHINX EREMITUS Hübner. Raleigh, Sept. 22, 1910, a full grown larva taken on *Monarda*, also recorded from Mitchell County.

SPHINX KALMIAE S. and A. Raleigh, July 13, 1914, one bred, also taken at Chapel Hill in May, 1916, by G. B. Lay.

CHLAEONOGRAMMA JASMINEARUM Bdvl. Two under light at Raleigh in late July, taken by G. B. Lay.

PAONIAS ASTYLUS Drury. Raleigh, Aug. 31, 1914, one at light.

PAONIAS MYOPS S. and A. Raleigh, Sept. 7, 1914, one caught by cat; also taken at Southern Pines by Manee in August, 1908.

LYCOMORPHA PHOLUS Drury, Lake Fairfield, August, 1904, F. M. Jones.

CLEMENSIA ALBATA Pack. Raleigh, late August, one.

OZONADIA UNIFASCIA G. and R. Raleigh, common on goldenrod flowers in September and October, 1914, also taken in mid June, 1914.

UTETHEISA ORNATRIX Linn. Southern Pines one specimen, A. H. Manee.

HAPLOA CLYMENE Brown. Brinkleyville, one July 16, 1912, taken and sent in by Miss Mary Hinton.

HAPLOA COLONA Hübner. Lake Ellis, very common in May and June, 1905 to 1908, also at Clayton, May 22, 1902.

HAPLOA LECONTEI var DYARI Merrick. Southern Pines, June 11, 1907, June 13, 1914, A. H. Manee.

ESTIGMENE CONGRUA Drury. Raleigh, May, April, July and August, not uncommon, also at Spruce in late May, 1912.

APANTESIS ANNA Grote. Balsam, one in collection, T. M. Rickards.

APANTESIS MICHABO Grote. Southern Pines, April 4, 1912, Manee.

APANTESIS PLACENTIA S. and A. Southern Pines, June, 1920, W. T. Davis.

APANTESIS RADIANS Walker. Raleigh, May, July and September, also taken at Southern Pines.

APANTESIS VIRGO Linn. Balsam, Blowing Rock, Black Mt., and Hendersonville, all mountain localities, in July and September.

APANTESIS VITTATA Fabr. Raleigh, July and October.

PYGARCTIA ABDOMINALIS Grote. Southern Pines, A. H. Manee.

HALISIDOTA LONGA Grote. Raleigh, mid June, 1907, one, FS.

HALISIDOTA MACULATA Harris. Southern Pines, one, Manee.

CHARADRA DERIDENS Guenée. Raleigh, late August, 1919, one, CSB.

ACRONYCTA BETULAE Riley. Hamlet, August, 1892, F. M. Jones.

ACRONYCTA DACTYLINA Grote, same data as preceding.

ACRONYCTA EXILIS Grote. Raleigh, July and August.

ACRONYCTA HAMAMELIS Guenée. Mitchell Co., July, Dr. H. Skinner.

ACRONYCTA HASTA Guenée. Raleigh, June, Hamlet, August.

ACRONYCTA LITHOSPHILA Grote. Raleigh, May 22, 31, 1921, CSB.

ACRONYCTA OVATA Grote. Raleigh, June and July.

ACRONYCTA SUBOCHREA Grote. Raleigh, April, one male.

PHOBOLOSIA BRIMLEYANA Dyar. Raleigh, September 8, 1907, CSB.

CHYTONIX PALLIATRICULA Guenée. Raleigh, March and April; Hamlet, August.

BAILEYA DOUBLEDAYI Guenée. Hendersonville, July, 1907, FS.

ATHETIS TARDA Guenée. Raleigh, early September, 1909.

PERIGAEA SELENOSA Grote. Raleigh, mid August, 1919.

PERIGAEA XANTHIOIDES Guenée. Southern Pines, July, August, 1901, FMJ.

HADENA ARCTICA Boisd. Mitchell Co., July, Dr. Skinner.

HADENA DEVASTATRIX Brace. Lake Fairfield, August, 1904, FMJ.

HADENA FRACTILINEA Grote. Raleigh, late September, 1909.

HADENA LIGNICOLOR Guenée. Mitchell Co., July, Skinner.

HADENA MODICA Guenée. Raleigh, early September, Lake Fairfield, August, Mitchell Co., July.

HYPPA XYLINOIDES Guenée, Spruce (Haywood Co.) late May, 1912, CSB.

MAGUSA DISSIDENS Felder, Raleigh, mid and late August, 1919, CSB.

RHYNCHAGROTIS ALTERNATA Grote, Raleigh, in September and October.

EUERETAGROTIS PERATTENTA Grote, Mitchell Co., July, Skinner.

SEMIOPHORA BADICOLLIS Grote. Raleigh, October.

AGROTIS NORMANNIANA Grote, Grandfather Mt., September 21, 1915, FS.

AGROTIS UNICOLOR Walker, Grandfather Mt., September 2, 1915, F. Sherman.

PERIDROMA RUDENS Harvey, Hamlet, August, 1892, FMJ.

NOCTUA BICARNEA Guenée, Blowing Rock, August, 1906, FS.

FELTIA GLADIARIA Morrison, Raleigh, moths scarce in October, although the larvae are the worst and commonest of the spring cutworms.

POROSAGROTIS VETUSTA Wlkr., Southern Pines, larvae taken by R. W. Caviness in April, 1901, also observed by W. L. McAtee at Poplar Branch (Anson Co.) in September, 1909 (Bull. 109, US. Dept. Agr., Div. Ent.)

EUXOA TESSELLATA Harris, Blowing Rock, July, 1911, FS.; Mitchell Co., July, Skinner.

MAMESTRA ADJUNCTA Boisd., Raleigh, late August, 1919, CSB.

MAMESTRA CAPSULARIS Guenée, Southern Pines, May 2, 1914, AHM.

MAMESTRA LOREA Guenée, Spruce, late May, 1912, CSB.

MAMESTRA OLIVACEA Morrison, Grandfather Mt., September 2, 1915, FS., Mitchell Co., July, Skinner.

MAMESTRA RENIGERA Stephens, Raleigh, May, September and October.

CIRPHIS PSEUDARGYRIA Guenée, Raleigh, August 8, 1915, CSB: Southern Pines, July, August, 1901, FMJ: Blantyre, early May, 1908, FS.

ORTHODES VECORS Guenée, Blantyre, early May, 1908, FS.

GRAPHIPHORA OVIDUCTA Guenée, Raleigh, April, May and September, not uncommon. Wilmington, April 13, 1920, Max Kisliuk.

TRICHOLITA SIGNATA Walker, Raleigh and Lake Fairfield, in August, Mitchell county in July.

GRAPTOLITHA LATICINEREA Grote, Raleigh, December 8, 1918, CSB.

GRAPTOLITHA VIRIDIPALLENS Grote, Raleigh, January 24, 1920, CSB.

CUCULLIA CONVEXIPENNIS G. and R., Asheville, summer, 1915, Mitchell county, July.

CUCULLIA LAETIFICA Lintner, Raleigh, mid August, 1911.

BELLURA GORTYNOIDES Walker, Hamlet, August, 1892, FMJ.

SPHIDA OBLIQUA Walker, Raleigh, several bred in April.

GORTYNA NICTITANS Bork., Mitchell Co., July, Skinner.

GORTYNA VELATA Walker, same data as preceding.

PAPAIPEMA POLYMNIAE Bird, Black Mts.

PYRRHIA UMBRA Hufn., Raleigh, June, August, Elizabeth City, August.

EUCIRRHOEDIA PAMPINA Guenée, Raleigh, late October, 1920, Waynes, September 14, 1908, Z. P. Metcalf.

GLAEA INULTA Grote, Raleigh, October, two.

GLAEA VIATICA Grote, Raleigh, one each in October, November, January and February.

RHODOPHORA FLORIDA Guenée, Mitchell Co., July, Skinner.

SHINIA GRACILENTA Hübner, Hamlet, August, 1892, FMJ.

SCHINIA GLORIOSA Strecker, Southern Pines, Manee.

SCHINIA JAGUARINA Guenée, Southern Pines, August, AHM.

SCHINIA LYNX Guenée, August 16, 1909, AHM.

SCHINIA TRIFASCIA Hübner, Raleigh, August 13, 1921, CSB; Southern Pines, September 9, 1909, AHM.

LYGRANTHOECIA BREVIS Grote. Southern Pines, Manee.

LYGRANTHOECIA CAROLINENSIS Smith, Southern Pines, August.

LYGRANTHOECIA CONSTRICTA Edw., "NC" in Dyar's List N. Am. Lepidoptera, 1902, p. 190.

ACHERODA FERRARIA Walker, White Lake (Bladen Co.), mid April, 1910, ES.

PLAGIOMIMICUS PITYOCHROMUS Grote, Raleigh, August 28, 1907, CSB.

PLUSIA PRECATIONIS Guenée, Raleigh, Southern Pines, Mitchell Co., April, May, July and August.

EUCALYPTERA BIPUNCTA Morrison, Hamlet, Southern Pines, July, August, FMJ.

EUCALYPTERA HUMERALIS Smith, "NC in August," Smith, Trans. A. E. S., XXIX, p. 220.

EUCALYPTERA OBSCURA Grote, Raleigh, August 31, 1907, CSB.

DORYODES BISTRIARIS Geyer, Beaufort, early June, 1909, FS.

PLEONECTYPTERA HABITALIS Walker, Hamlet, July, August, 1901, FMJ.

EUSTROTIA MUSTA G. and R., Raleigh, July 27, 1902, Hendersonville, July, 1907, FS.

EXYRA RIDINGSII Riley, Hamlet and Southern Pines, July, August, White Lake, June.

EXYRA SEMICROCEA Guenée, Hamlet and Southern Pines, July, August.

EXYRA ROLANDIANA Grote, same date as preceding.

SPRAGUEIA ONAGRUS Guenée, Raleigh, mid June, 1909.

CALLOPISTRIA FLORIDENSIS Guenée, Raleigh, bred in September and October from ferns, both outside and in greenhouse.

HYAMIA PERDITALIS Walker, Raleigh, mid June, 1907.

DRASTERIA CRASSIUSCULA Haw., Raleigh, mid June, 1909.

EUCLIDIA CUSPIDEA Hübner, Blantyre, early May, 1908, FS.

MELIOPOTIS LIMBOLARIS Geyer, Lake Fairfield, August, FMJ.

SYNEDA GRAPHICA Hübner, Wilmington, April 13, 1920, M. Kisliuk.

CATOCALA SAPPHO Strecker, Southern Pines, Manee.

CATOCALA VIDUA S. and A., Raleigh, September and October, rare.

CATOCALA RETECTA Grote, Lake Fairfield, August, 1904, FMJ.

CATOCALA OBSCURA Str., Raleigh, July 21, 1920, CSB.

CATOCALA TRISTIS Edw., Raleigh, July 8, 1921, CSB.

CATOCALA UNIJUGA Wlkr., Raleigh, August 14, 1916, CSB.

CATOCALA NEOGAMA S. and A., Raleigh, September and October, rare.

CATOCALA MULIERCULA Guenée, Raleigh and Beaufort in July, also from Southern Pines.

CATOCALA SERENA Edw., Raleigh, July 29, 1919, CSB.

CATOCALA SIMILIS Edw., Southern Pines, A. H. Manee.

CATOCALA FRATERCULA G. & R., Raleigh, June 25, 1915, CSB.

CATOCALA GRACILIS Edw., Raleigh, July 15, 1915, CSB., Grandfather Mt., September 2, 1915, FS., also from Southern Pines.

PHOBERIA ATOMARIA Harvey, Raleigh, March.

GRAMMODES SMITHII Guenée, Raleigh, August 2, 1919, one, CSB.

PHURYS CAROLINA Smith, Raleigh, two in May and August, CSB: White Lake, three in mid April, 1910, FS.

TRAMA DETRAHENS Walker, Raleigh, July to September; White Lake, mid April: Southern Pines, July, August.

PHEOCYMA AERUGINOSA Guenée, Raleigh, April, June, July; Blantyre, May; Tryon, April, May, July, August.

PHEOCYMA BETHUNEI Smith, Tryon, August.

PHEOCYMA CORACIAS Guenée, Southern Pines, July, August, 1901, FMJ.

PHEOCYMA CUREMA Smith, Raleigh, May, July, August; Tryon, June.

PHEOCYMA LINEOSA Walker, Raleigh, June to September, not uncommon.

PHEOCYMA METATA Smith, Raleigh, July and August.

EREBUS ODORA Linn., Raleigh, one in late August 1912, G. B. Lay; also once taken at Southern Pines by A. H. Manee.

EPIZEUXIS ROTUNDALIS Walker, Raleigh, mid August, 1909.

ZANCLOGNATHA CRURALIS Guenée, White Lake, June, 1910, FS.

HORMISA ABSORPTALIS Walker, Raleigh, June.

GABERASA AMBIGUA Walker, Raleigh, mid August, 1909, CSB.

DIRCETIS VITREA Grote, Raleigh, August.

BOMOLOCHA BALTIMORALIS Guenée, Hamlet and Lake Fairfield, August, FMJ.

BOMOLOCHA MADEFACTALIS Guenée, Raleigh, late July, 1912, CSB.

Most of the really hard identifications are by or confirmed by Dr. H. G. Dyar, of the U. S. National Museum, to whom I express my sincere gratitude for his invariable kindness in identifying our material.

Life-History of, and Notes on, Certain Chrysomelidae (Coleoptera).

By E. M. CRAIGHEAD, Bureau of Plant Industry, Harrisburg, Pennsylvania.

During the past two years the writer has been collecting and studying the larvae of the family Chrysomelidae. Many of these larvae could be obtained only by rearing methods, and very often in order to identify the species it was necessary to rear them through the adult age. The following notes include records and observations made at the Field Laboratories of the Pennsylvania Bureau of Plant Industry, located at Chambersburg and North East, and are published at the suggestion of Prof. J. G. Sanders, Director of the Bureau.

Oedionychis gibbitarsa Say, Chambersburg, Pa., June 6.

Many adults were collected by sweeping on undetermined mint, and were then caged on plants brought into the laboratory. Copulation was observed the following day and two days later many eggs were collected in masses under small particles of debris. The eggs were placed on end and fastened together by some secretion. Oviposition continued over a period of two weeks, and an average of eleven days elapsed before larval emergence. In most cases the larvae emerged through a longitudinal slit, but in several instances they emerged through the end of the eggs. Eggs were never observed on the host plant. As soon as the larvae emerged they crawled upon the host plant and began to feed. After feeding for 18 days, average, the larvae entered the ground and constructed a small earthen cell within which they pupated four to five days later, transforming to adults eight days later. This species hibernates as adults.

Zygogramma suturalis Fabr., Chambersburg, Pa., August 8.

Fifty-seven larvae collected by sweeping ragweed (*Ambrosia trifida* L.). Larvae were transferred to potted plants in the laboratory. August 19, larvae entered ground and pupated two days later in small earthen cells. On September 1, adults emerged. Hibernate as adults.

Monocesta coryli Say, St. Thomas, Pa.

During August thousands of larvae were feeding on the foliage of slippery elm (*Ulmus fulva* Michx.) and by the latter part of the month the trees were completely defoliated. Many larvae were collected and adults reared with the expectation of securing some parasites, but without results. So abundant were the larvae that a few more years of defoliation will probably kill the trees. Fortunately this tree is not used in this locality for ornamental purposes and the infestation is quite limited; in fact, this appears to be the only place in the State where this insect has been recorded as destructive. Mr. George L. Ehrhardt records it from St. Thomas, August 4, 1913. The larvae hibernate 3-4 inches under the sod. This insect has been recorded previously from Virginia, Illinois, Kansas, Missouri and Florida.

Chrysochus auratus Fabr., Chambersburg, Pa., 1922.

Many adults were observed feeding and ovipositing on dogbane (*Apocynum cannabinum* L.). A short description of the egg-laying habits is presented by J. L. Zabriskie*. The newly hatched larvae fall to the ground and at once commence feeding on the tender roots. In May of the next year the larvae are nearly full grown and can be found feeding on the larger roots 1-6 inches below the ground. The bark on the roots is quite thick and very often the larvae by feeding will make a pocket large enough so that when the root is removed from the soil the larvae remain attached to the root. They hibernate in the larval stage. First pupae were found May 16; pupal duration about twenty days. Adults first noted June 4.

Longitarsus subrufus Lec., Chambersburg, Pa.

During July, 1921, hundreds of adults were collected by sweeping false gromwell (*Onosmodium hispidissimum* Mackenzie). Many of the adults were dissected and the females contained eggs. Egg-laying habits were not observed, but it is probable that the eggs are placed at the base of the plant on the surface or just under the ground. The larvae feed on the roots and are not very active. On examining infested roots one may find the larvae in their galleries or among the roots and when about to pupate they move a little distance away from the host.

The larva has a well-developed labrum, three-jointed maxillary palpus, ninth abdominal segment well developed, legs present, antennae two-jointed, body straight and cylindrical; 0.7 mm. to 1.2 mm. long and 0.1 mm. wide. It resembles the larva of *Diabrotica*. The larvae move around until they have formed well-defined cells in the soil and two days later pupate. Larvae remain in pupal stage from 9-15 days, averaging 10.6 days. Hibernate as larvae.

The adults feed on the leaves of *Onosmodium* and cut small irregular holes through them. Where the host was found the beetles were very abundant and by the latter part of August defoliation was complete. The adults are very active and when disturbed jump to another part of the host plant or fall to the ground where they conceal themselves under leaves. Previously recorded from Kansas and Indiana.

*Journal of New York Entomological Society—Vol. III, p. 192 (1895)

Systena hudsonias Forst., Chambersburg and North East, Pa.

This small Chrysomelid has many host plants, none of which are of economic importance except the grape. In Erie County, Pa., the feeding of the adults on grape foliage was so extensive that in many cases it reduced the vitality of the vine and the grapes did not mature properly. The leaves in many instances appear as if riddled with small shot and they then turn brown. Other host plants are ragweed, elder, smartweed, pigweed, horseweed, goldenrod and "brown-eyed susan."

Many adults were collected during May and placed in a cage with a potted *Solidago* plant. July 7, ten eggs were removed from the cage. The eggs were in most cases laid singly and were either placed at the base of the plant or under small lumps of dirt an inch or two from the plant. In one instance eggs were found three inches in the ground and the dead female was found beside them. The eggs are light yellow in color, 1mm. long and 1-30mm. wide. The larvae feed on the roots and hibernate in this stage. By the middle of July few adults could be found in the field. The first appearance of adults is about the middle of May and this seems to hold good for the greater part of the State. The egg stage is about eight days. Twenty-eight larvae were collected May 11 while digging for *Chrysochus* larvae. Larvae under laboratory conditions pupated on top of soil. This was due to the fact that each day they were disturbed so as to get the exact pupa stage. The pupa stage averaged 13.9 days. This insect is very abundant in uncultivated fields and orchards, and along fence rows. Clean cultivation will undoubtedly kill many of the larvae. It is doubtful if this insect will ever become of great economic importance for even with the grape the infestations are in most cases along the outer edge of a vineyard.

Manuals of Hemiptera in Preparation.

Just now [Feb. 10, 1923] I am busy correcting proof for the *Hemiptera of Connecticut*, so that work should be out within three months. My work on the family Miridae amounts to a revision of the species for the northeastern states. It will merely require additions, and boiling down of descriptions of new species, to complete my work for the *Manual of Hemiptera*, which a half-dozen of us are preparing.—H. H. KNIGHT, University of Minnesota, St. Paul, Minn.

ENTOMOLOGICAL NEWS

PHILADELPHIA, PA., APRIL, 1923.

The Number of Living Insects.

We are frequently told that this is the Age of Insects, that there are more species of insects than of all other animals. It is interesting to have, from time to time, the latest figures on the number of insects. Perhaps the most recent census is that of Dr. Anton Handlirsch, who is furnishing the historical, paleontological and systematic parts of the newest German text book —the *Handbuch der Entomologie,* edited by Prof. Dr. Chr. Schröder, of Berlin-Lichterfelde. Dr. Handlirsch's paleontological contribution may be considered as a revised and abridged edition of his *Die Fossilen Insekten,* and we look forward to a review of it in the NEWS from the pen of Prof. T. D. A. Cockerell. Near the close of chapter 7, Paleontologie, 1921, Dr. Handlirsch has a Tabular Review of the Development in Time of the orders and families of insects in past geological periods and in the present. His figures for this last may be summarized as follows:

Orders	Families	Species	Orders	Families	Species
Thysanura	2	250	Corrodentia	6	600
Entotrophi	3	105	Mallophaga	2	1,350
Protura	2	15	Siphunculata	2	80
Collembola	4	1,030	Coleoptera	98	(195,000)
Ephemerida	1	450	Strepsiptera	1	150
Odonata	10	2,600	Hymenoptera	24	67,500
Perlariae	1	480	Megaloptera	2	100
Embiodea	1	60	Raphidides	1	40
Saltatoria	11	9,500	Neuroptera	6	2,000
Phasmida	5	1,900	Panorpatae	4	163
Dermaptera	4	740	Trichoptera	1	1,600
Diploglossata	1	2	Diptera	40	51,000
Thysanoptera	2	500	Suctoria	1	350
Blattariae	1	2,000	Lepidoptera	39	92,000
Mantodea	1	1,000	Heteroptera	36	21,000
Isoptera	3	500	Homoptera	11	16,000
Zoraptera	1	3			

Total: 33 orders, 327 families, 470,000 species of living Insects.

New Names in the Order Lepidoptera.

My attention has recently been called to two homonyms which I published while with Dr. Barnes. Mr. F. H. Benjamin points out that *Oncocnemis punctilinea* B. & L. (Bull. Brook. Ent. Soc. xvii, 71, 1922) is preoccupied by *O. punctilinea* Hampson. I propose the new name ONCOCNEMIS BENJAMINI for this species, in recognition of Mr. Benjamin's excellent work on the Noctuidae.

Through Mr. Charles P. Alexander, I learn that *Nothophila* B. & L. (Bull. Brook. Ent. Soc. xvii, 75, 1922) is preoccupied by *Nothophila* Alexander in Tipulidae, published earlier in 1922. I propose the new name BANDELIA for this genus.

A third item deals with an error in our treatment of *Argus* Scopoli in the Ann. Ent. Soc. Am. xv, 90, 1922. Captain N. D. Riley, of the British Museum, has called Mr. Benjamin's attention to the fact that this name is preoccupied, and that *Satyrodes* will stand.—A. W. LINDSEY, Denison University, Grantville, Ohio.

On the Authorship of the Encyclopédie Méthodique, Vol. IX. A Correction (Lepid.).

In the ENTOMOLOGICAL NEWS for Nov., 1922 (xxxiii, 281-2), I called attention to an apparent mistake in the customary citation of authorship of the species of Lepidoptera described in this work. As has happened many times before, incomplete evidence led to erroneous conclusions. Even in these I was preceded by Sherborn and Woodward, Ann. & Mag. Nat. Hist. (7), xvii, 577-582, 1906. Mr. George Talbot, of the Hill Museum, has kindly brought this reference to my attention, and I am indebted to Dr. Calvert, editor of the NEWS, for supplying me with a summary of its contents.

The paper by Messrs. Sherborn and Woodward is entitled "On the Dates of Publication of the Natural History Portions of the 'Encyclopédie Méthodique'." According to Dr. Calvert's summary, the authors draw from apparently reliable sources evidence that part one of volume nine, including pages 1-328, was published in 1819, while part two, including pages 329-828, did not appear until 1824. In a footnote they express the same erroneous conclusion as my own, in the following words: "9. Mr. Kirby has copies of these two parts as issued. The article 'Papillons' was written by Godart (see the preface to the volume)."

The error in this conclusion and the actual authorship of the species concerned are fully explained in a letter from Dr. Karl Jordan, dated Dec. 12, 1922. Dr. Jordan has brought to my attention another footnote in the Encyclopédie Méthodique which, with the evidence pointed out in my previous note, explains the division of the work on this volume completely. This footnote is on page 706, under the introduction to the "Hespérides", and reads as follows: "Afin d' accélérer le publication de ce demi volume, je me suis chargé de la rédaction de cette tribu des lépidopteres diurnes; j' en excepte seulement le genre *Uranie* et les

Hespéries d 'Europe. Latreille." This shows conclusively that Latreille himself described the exotic skippers, and accounts for *Hesperia godart* without reflection on the modesty of his learned collaborator.

In conclusion it may be well to cite Dr. Jordan's summary, which states that the butterflies, *Urania, Castnia, Agarista* and the European Hesperiidae were written up by Godart; the exotic Hesperiidae were handled by Latreille. Certain internal evidence also bears out these points. Dr. Jordan further states that "Kirby and others quote Latreille as the author of the Castnids. It should be Godart. The same applies to '*Agarista Leach*', which is a *Coronidia*."—A. W. LINDSEY, Denison University, Granville, Ohio.

Preservation of Rare Species.

In the *Entomologist* for February, 1923, we note a paragraph by N. D. Riley, "Preservation of rare species," in which he mentions that by a Police Order of 30th June, 1921, certain species of butterflies in Prussia are placed under protection, and comments that it is "a pity no such law exists in this country [England] for the protection of our rare insects . . ."

Entomological Literature

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded.

The numbers in Heavy-Faced Type refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

The records of papers containing new genera or species occurring north of Mexico are grouped at the end of their respective Orders.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

The titles occurring in the Entomological News are not listed.

4—Canadian Entomologist, Guelph, Canada. **6**—Journal of the New York Entomological Society. **9**—The Entomologist, London. **10**—Proceedings of the Entomological Society of Washington, D. C. **11**—Annals and Magazine of Natural History, London. **15**—Insecutor Inscitiae Menstruus, Washington, D. C. **20**—Bulletin de la Societe Entomologique de France, Paris. **22**—Bulletin of Entomological Research, London. **41**—Bulletin de la Societe Entomologique Suisse, Bern. **50**—Proceedings of the United States National Museum. **67**—Le Naturaliste Canadien, Quebec. **76**—Nature, London. **89**—Zoologische Jahrbucher, Jena. **90**—The American Naturalist, Lancaster, Pa. **93**—Bulletin, Division of the Natural History Survey, Urbana, Illinois. **124**—Bulletin de la Societe Entomologique d'Egypte, Cairo. **138**—American Museum, Novitates, New York.

GENERAL. **Bather, F. A**—The rule of priority in nomenclature. **76,** cxi, 182-3. **Campos, F.**—Estudios sobre la fauna entomologica del Ecuador. IV, Himenopteros. V, Neuropteros. VI-VII, Trichopteros, Euplexopteros. (Rev. Col. Nac. Vicente Rocafuerte, Guayaquil, 1922, iv, 53-78.) **Folsom, J. W.**—Entomology with special reference to its ecological aspects. Rev. Ed. 3. (Philadelphia, P. Blakiston Son & Co., 1922, 502 pp.) **Lizer, C.**—Primer ensayo bibliografico de entomologia Argentina. (Prim. Reun. Nac. Soc. Argentina Cien. Nat., 1916, 321-80.) **McDunnough, J.**—Qu'est-ce que l'entomologie. **67,** xlix, 153-5. **Moreira, C.**—Entomologia agricola Brasileira. (Min. Agr., Indus. e Comm., Rio de Janeiro, Bol. No. 1, 182 pp., 1921.) **Scheerpeltz, O.**—Meine bisherigen erfahrungen mit der schwemm-methode als rationelle sammelweise fur terricole kleintiere. **124,** iii, 8-10, cont. **Wade, J. S.**—On entomological publications of the U. S. Government. **10,** xv, 1-32. **Weiss & West**—The insects and plants of a moist woods on the piedmont plain of New Jersey. **6,** xxx, 169-91.

ANATOMY, PHYSIOLOGY, ETC. **Breitenbecher, J. K.**—A red-spotted sex-limited mutation in Bruchus. **90,** lvii, 59-65. **Brocher, F.**—Les trachees inversees. **41,** xiii, 259-61. **Clausen, R. E.**—Inheritance in Drosophila hydei. I. White and vermilion eye-colors. **90,** lvii, 52-58.

ARACHNIDA AND MYRIOPODA. **Dempsey, J. H.**—A list of Araneida collected at Concord, Mass. (Proc. Thoreau Mus. Nat. Hist., i, 42-3.)

THE SMALLER ORDERS OF INSECTA. **Campos, F.**—Catalogo sistematico y sinonimico de los Odonatos regionales. (Ecuador). (Rev. Col. Nac. Vicente Rocafuerte, Guayaquil, 1922, iv, N. 8, 1-75). **Jorgensen, P.**—Los Tricopteros Argentinos. (Prim. Reun. Nac. Soc. Argentina Cien. Nat., 1916, 389-99.) **Pierson, E. L.**—A list of Odonata collected at Concord, Mass. (Proc. Thoreau Mus. Nat. Hist., i, p. 41.) **Withycombe, C. L.**—The wing venation of Raphidia maculicollis. **9,** lvi, 33-5.

ORTHOPTERA. **Caudell, A. N.**—Steiroxys hendersoni, a new katydid. **50,** lxii, Art. 22.

HEMIPTERA. **Lizer, C.**—Una nueva subespecie de "Ceroplastes de la Republica Argentina. Sobre una nueva hemipterocecidia Argentina. (Prim. Reun. Nac. Soc. Argentina Cien. Nat., 1916, 381-82; 383-88.) **Williams, C. B.**—A froghopper damaging cacao in Panama. **22,** xiii, 271-4.

Duncan, C. D.—The N. Am. species of Phylloxera infesting oak and chestnut. **4,** liv, 267-76.

LEPIDOPTERA. **Adkin, R.**—The relative attractiveness of various kinds of light for moths. **9,** lvi, 43-4. **Gable & Baker**—Notes on a migration of Libythea bachmanni. **4,** liv, 265-6. **Glenn, P. A.**

—Codling-moth investigations of the state entomologist's office, 1915-1917. **93,** xiv, 219-89.

Dyar, H. G.—The N. Amer. short-winged Psychidae. Note on Cucullia alfarata. A note on Datana perspicua. New American L. **15,** xi, 1-5; 5-7; 10-11; 12-30. **McDunnough, J.**—A new western Catocola. **4,** liv, 288.

DIPTERA. Aldrich, J. M.—New genera of two-winged flies of the subfamily Leptogasterinae of the family Asilidae. **50,** lxii, Art. 20. **Bonne-Wepster & Bonne**—A new Megarhinus from Surinam. **15,** xi, 7-9. **Dunn, L. H.**—Observations on the oviposition of the housefly, Musca domestica, in Panama. **22,** xiii, 301-5. **Johannsen, O. A.**—Stratiomyiid larvae and puparia of the Northeastern states. **6,** xxx, 141-53. **Wille, J.**—Biologische und physiologische beobachtungen und versuche an der kasefliegenlarven (Piophila casei). **39,** xxxix, Zool., 301-20.)

Curran, C. H.—New D. in the Canadian Nat. collection. **4,** liv, 277-87. **Dyar, H. G.**—The mosquitoes of the Yellowstone national park. **15,** xi, 36-46. **Kieffer, J. J.**—Diagnose de quelques nouveaux Tanypodines. **20,** 1922, 296-7.

COLEOPTERA. Wolcott, A. B.—The male of Cymatodera horni. (Cleridae). **6,** xxx, 191-4. Two new species of West Indian Cleridae. **138,** No. 59. **Sampson, W.**—Notes on the nomenclature of the family Scolytidae. **11,** xi, 269-71. **Hawkins, D. C.**—A list of C. collected at Concord, Mass. (Proc. Thoreau Mus. Nat. Hist., i, 44-47.) **Campos, F.**—Estudios sobre la fauna entomologica del Ecuador. III. Coleopteros. (Rev. Col. Nac. Vicente Rocafuerte, Guayaquil. 1921, No. 6, 24-100.)

Blackman, M. W.—Mississippi bark beetles. (Miss. Agr. Exp. Sta., Tech. Bull., 11, 130 pp., 1922.) **Dawson, R. W.**—New species of Serica (Scarabaeidae). V. **6,** xxx, 154-69. **Fall, H. C.**—A review of the North Am. species of Agabus, together with a description of a n. g. and sps. of the tribe of Agabibi. (Mount Vernon, N. Y., J. D. Sherman, Jr., 1922, 36 pp.) A revision of the N. Amer. species of Hydroporus and Agaporus. (Privately printed, Jan., 1923, 129 pp.) **Knaus, W.**—Two new forms of Cicindela with remarks on other forms. **6,** xxx, 194-7.

HYMENOPTERA. Frisch, K. V.—Ueber die "sprache" der bienen. **89,** xl., Zool., 1-186. **Forel, A.**—Le monde social des fourmis. Tome I-III (1921-1922). Geneve, Libr. Kundig. **Yuasa, H.**—A classification of the larvae of the Tenthredinoidea. (Illinois Biol. Mon., vii, No. 4.)

Cockerell, T. D. A.—Descriptions and records of bees.—XCVII. **11,** xi, 263-8. **MacGullivray, A. D.**—Species of Dolerus from Oregon. **15,** xi, 31-5.

ENTOMOLOGY WITH SPECIAL REFERENCE TO ITS ECOLOGICAL ASPECTS. By JUSTUS WATSON FOLSOM, Sc.D. (Harvard) Assistant Professor of Entomology at the University of Illinois. Third Revised Edition. With five plates and 308 text-figures. Philadelphia, P. Blakiston's Son & Co., 1922. 8 vo., pp. vii, 502.

The two previous editions of this work have been reviewed by the present writer in the NEWS for September, 1906, and for November, 1913, respectively. In the first place cited, this statement was made: "The book seems to us to be excellently adopted as a text-book in zoological courses in which the aim is to understand insects as a whole without laying especial emphasis on the taxonomy, or the special morphology or embryology of any particular group or set of structures. . . ." After sixteen years of additional experience in the class room, he finds himself still holding this opinion, adding that he has never advocated the use of any one book unaccompanied by frequent reference to many other publications dealing with special topics.

The two preceding editions bore the words "Biological and Economic," instead of "Ecological," on the title page* and in conformity with this change is the addition of a new chapter (XIII) "Insect Ecology," pp. 348-409. Its subject headings are:

I. Conditions of Terrestrial Existence. 1. Soil; 2. Atmosphere: Light, Temperature, Pressure, Moisture, Composition, Movement, Electricity, Evaporation; 3. Food Relations; 4. Biotic Conditions.
II. Conditions of Aquatic Existence. 1. Chemical Conditions; 2. Physical Conditions; 3. Food Conditions; 4. Biotic Conditions.
III. Environmental Factors in General.
IV. Classification of Environments.
V. Communities.
VI. Examples of Insect Communities: Grasshoppers [in Michigan after Vestal], Communities of Streams [after Shelford], Community Relations in New Mexico [after J. R. Watson].
VII. Succession.

Lest the general commendation of the book given above be interpreted to cover all its contents, be it remarked in passing that this classification of the subject matter of ecology is not that which seems the most satisfactory.

The typesetting of this third edition is new throughout, although the page form remains the same. There is one additional plate, four additional text-figures, and some other new ones, and 100 more pages than in the second edition. The text, including the copious bibliography (now of 48 pages) at the end thereof, has been extensively revised, so that one notes many omissions, changes and additions in comparison with its immediate predecessor.

The number of classes of Arthropods is raised from 6 to 9 by the

*The *cover* of our copy of the third edition has the old title.

recognition of the Pauropoda, Symphyla and Myrientomata as of that rank. Changes are made in the statements of the characters, and in the sequence, of the Orders of Insects, now numbering 17 by the admission of the Dermaptera, Parasita and Strepsiptera. The Platyptera are retained to include Isoptera, Embioptera, Zoraptera, Corrodentia and Mallophaga as suborders. A number of new paragraphs on the interrelationships of the orders are to be found on pages 22-26. The name Locustidae is accepted for Acrididae and Tettigoniidae for Locustidae ((pp. 62, 63, 92). Interesting statements of the author's present views on the homologies and segmental value of the superlinguae are given on pages 36-37, 44, 81, 133 and 135. Voss' elaborate work on the thoracic muscles of the cricket might have been mentioned on page 78. Much new matter has naturally been incorporated into the chapters on Transmission of Diseases by Insects, Insect Behavior and Insects in Relation to Man. Under geological distribution, pp. 340-347, is no statement of the Australian Triassic Insects or of the actual discoveries at Florissant by Prof. Cockerell.

But who is the entomologist who can write a book on all insects to satisfy all his colleagues?—PHILIP P. CALVERT.

OBITUARY.

The death of DR. KÁLMÁN KERTÉSZ of Budapest, Hungary, December 28, 1922, has left a regrettable void in the ranks of the World's scientists. His published works in Dipterology are well known and are of the highest quality. For the greater part they are such that the enormous amount of labor involved in their preparation is seldom realized by those benefited, and they stand as unembellished monuments to their deceased author. Dr. Kertész was born January 2, 1867, and so was in the fifty-fifth year of his life. He was Director of the Hungarian National Museum, and a member of several European and American Entomological Societies. Of his more important publications may be mentioned the *Catalogus Dipterorum*, of which seven volumes have been issued, completing the Orthorrhapha and the Cyclorrhapha aschiza (Families Syrphidae, Pipunculidae and Phoridae), leaving the great Schizophora, or Myodaria, still to be published. It is hoped that the manuscript for this latter is available and in shape for publication, or nearly so. At the time of his death he was publishing a contribution towards a monograph of the Stratiomyidae and allies (*Notocantha*). He worked up the Lauxaniidae of the Sauter-Formosa expedition, and also published on this family and the Lonchaeidae of several other faunas, including that of North America. E. T. CRESSON, JR.

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EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Buprestidae, Cleridae, and **Carabinae** wanted from U. S. or Buprestidae of the world. Will collect insects of any group (except Lepidoptera) in exchange or pay cash. Alan S. Nicolay, 416a Grand Ave., Brooklyn, New York.

For Exchange—A large number of live cocoons of Callosamia promethea, C. cynthia and P. cecropia for other pupae or Lepidoptera. D. C. Heim, Sunbury, Pa.

Wanted to Exchange—N. A. Coleoptera for same not in my collection. Carl Selinger, 4419 Dover St., Chicago, Ill.

Wanted for Cash or Exchange—Catocala eggs, also brilliant colored butterflies and moths for trays. Mrs. Robert Milde, Lewiston, Minn.

Syrphidae from all parts of North America wanted. Monographing the family.—C. H. Curran, Department of Entomology, University of Kansas, Lawrence, Kansas.

Will collect in all orders except Lepidoptera, in exchange for Cerambycidae (longicorn beetles) and Pentatomidae (stink-bugs). G. Chagnon, P. O. Box 521, Montreal, Canada.

I will collect Coleoptera and Lepidoptera in southwest Arkansas for those so interested.—Miss Louise Knobel, 417 West 2nd Avenue, Hope, Arkansas.

Correspondence solicited from anyone desiring general collections of insects, to be made in Costa Rica. Austin Smith, Apartado 412, San José, Costa Rica.

Wanted—For cash, during winter of 1922 and 1923, pupae of Saturniid moths. Please state species, quantity and price. P. Rau, 2819 S. Kingshighway, St. Louis.

Wanted—Am working on a Revision of the Buprestidae of the West Indies and would like to examine any material in this family from that region. W. S. Fisher, U. S. National Museum, Washington, D. C.

For Exchange—A large number of Papilio Turnus, P. Cresphontes and P. Ajax pupae, or the same specimens in papers, for other pupae or Lepidoptera. Carl Selinger, 4419 Dover St., Chicago, Ill.

Wanted—Dytiscidae not in my collection, in exchange for local specimens. Offer Coelambus sellatus, Oregonus, etc. F. S. Carr, 11050 123rd St., Edmonton, Alberta.

Coleoptera for exchange—Cicin. generosa, hirticollis, modesta, sexguttata, 12-punctata, Saperda populnea, Uro. fasciata, Donacia subtilis, palmata, texana-minor, biimpressa, refuscens. Ernest Baylis, 5011 Saul St., Philadelphia, Pa.

Endomychidae. I desire to purchase representatives of this family from any part of the world. Particularly desire specimens from the western and southwestern part of the U. S. L. B. Walton, Kenyon College, Gambier, Ohio.

Buprestidae, Cleridae and **Carabinae** wanted from U. S. or Buprestidae of the world. Will collect insects of any group (except Lepidoptera) in exchange or pay cash. Alan S. Nicolay, 416a Grand Ave., Brooklyn, New York.

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Need American Entomologist III (N. S. I.) No. 12; Bulletin Brooklyn Entomological Society VI, VIII, IX and X No. 2 and index; Ann. Repts. Entomological Society Ontario, II, III, IV, IX; Entomologica Americana, VI; U. S. D. A. Bureau of Entomology bulletins, old series, 2, 3, 9, 20, 33.

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